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shows that butterflies effect the cross-fertilization of Alpine orchids. It seems that from twelve to fifteen per cent. of the orchids of the lowlands are fertilized by Lepidoptera, while from sixty to eighty per cent. of Alpine orchids are fertilized by the same kind of insects. This corroborates, he says, his view that the predominant frequency of butterflies in the Alpine region must have influenced the adaptation of Alpine flowers.

Müller has also shown the wonderful modifications brought about in the legs and mouth-parts of bees by their efforts in fertilizing flowers.

ZOOLOGY.

ON THE DEVELOPMENT OF THE NERVOUS SYSTEM IN LIMULUS.¹—After a good many unsuccessful attempts at discovering the first indications of the nervous system in the embryo of *Limulus*, I at length, in making fine sections, with the aid of the skill of Prof. T. D. Biscoe, discovered it in a transverse section of an embryo in an early stage of development, corresponding to that figured on plate iv, fig. 10, of my essay on the Development of *Limulus Polyphemus* in the Memoirs of the Boston Society of Natural History. The period at which it was first observable was posterior to the first blastodermic moult, and before the appearance of the rudiments of the limbs. The primitive band now surrounds the yolk, being much thicker on one side of the egg than on the other, the limbs budding out from this disk-like thickened portion which represents the outer or nervous layer of the germ. At the time the nervous cord was observed it was entirely differentiated from the nervous layer proper, and in section and relation to the nervous layer appeared much as in Kowalevsky's figure (33) of the germ of *Hydrophilus* (*Embryologische Studien an Würmen und Arthropoden*, 1871).

At a later stage in the embryo, represented by Pl. V, fig. 16 in my Memoir, at a period when the body is divided into a head and abdomen, and the limbs are longer than before, by a series of sections parallel with the under surface of the body, I could make out quite satisfactorily the general form of the main nervous cord. It then forms a broad thick mass, the two cords being united, with small holes between the cords opposite the sutures between the segments and situated between the primitive ganglionic centres.

¹ Read at the November (1874) Meeting of the National Academy of Sciences.

The nervous cord, as in the Acarina, is formed long before the other internal systems of organs; the development of the dorsal vessel some time after succeeding that of the nervous cord, while the alimentary canal is not formed until some time after the larva is hatched.

The next stage observed, and one of exceeding interest, was studied in longitudinal sections of the larval *Limulus*. If we make a longitudinal section of the young king crab when a little over an inch long, the disposition of the cephalothoracic portion of the cord is exactly as in the full-grown individuals. The nervous ganglia are then united into a continuous nervous collar surrounding the œsophagus, no ganglionic enlargements being observed, the collar in fact consisting entirely of ganglia, the commissures being obsolete; in front of the œsophagus and in the same plane as the œsophageal collar lies the supracœsophageal-ganglion, or so-called brain; not as usual in the normal crustacea, raised above the mouth into the roof of the head. On the contrary, the œsophagus passes behind the brain and through the collar at a right angle to the plane of the œsophageal collar and brain taken collectively. Now a section of the larva before moulting shows a most important and interesting difference as regards the ganglia which supply nerves to the appendages of the cephalothorax. These are entirely separate, the spaces between them, where they are connected by commissures, being as wide as the ganglia themselves are thick. Five ganglia were observed corresponding to five anterior pairs of members. It is probably not until after the first moult at least that the adult form of the nervous cord is attained.

Some interesting questions in the morphology of *Limulus* arise in connection with this discovery of the original separation of the ganglia of the head, which I will simply touch upon. The brain of *Limulus* differs remarkably from that of the normal crustacea, *i. e.*, the Decapods, in sending off no antennal nerves, but only two pairs of optic nerves, there being in fact in *Limulus* no antennæ. In the spiders and scorpion the disposition of the nervous system only resembles that of *Limulus* in the thoracic and cephalic ganglia being somewhat consolidated, but the brain is situated far above the plane of the thoracic mass, and the commissures are very long, and here also there are no antennal nerves, no antennæ being present, but a pair of nerves are distributed to the mandi-

bles. The general analogy in the form of the anterior portion of the nervous cord to the Arachnidan, by no means proves satisfactorily to my mind that the *Limulus* and *Merostomata* generally are Arachnida, as some authors insist, for, besides the remarkable difference in the form and position of the supraœsophageal ganglion above mentioned, there are other differences of much importance, which separate the *Merostomata* from both the Arachnida on the one hand, and the Crustacea on the other.

It will now be a matter of interest to study the development of the nervous cord in the Arachnida, at the stage where the cephalothoracic ganglia are separate and compare them with the same stage in *Limulus*.

The result may possibly show that the appendages of the anterior region of *Limulus* are in fact cephalic appendages or mandibles and maxillæ or maxillipeds, and in part truly thoracic; as in the spiders and scorpions the nerves to the maxillæ and legs are distributed from a common cephalothoracic mass of concentrated ganglia. — A. S. PACKARD, Jr.

THE PINE SNAKE. — As having some relation to the animosity which this reptile is supposed by the old residents of the Pines to bear towards the rattlesnake, I find an important observation which I have made, not mentioned in the article of the January number of the *NATURALIST*. As there noted, the Pine Snake, when alarmed or enraged, slowly inflates itself with air, thus nearly doubling its normal size along its entire length, except the tail. It then slowly expels the air with its own peculiar sound. While thus blowing in anger, the tail is made to perform a singular part in this manifestation of rage. The horny tip, or four-sided spike, is slightly elevated, and caused to vibrate with such rapidity as to produce a little fan of light, about an inch in length. Were this quadrangular spike a little flattened and constricted at intervals, and raised a little higher when set in vibration, we should have, with its buttons and functions, the true organ of the dreaded rattlesnake (*Crotalus horridus*). The sight of this in motion is certainly suggestive of the tail of a *Crotalus* in rudiment. If the tradition of the Pine Snake's enmity to the rattlesnake be true, it would not be the first instance of disagreement between relations.

In this connection may be mentioned our reading a slip from a

western paper, in which was stated that one of our large innoxious snakes was killed, which had swallowed a rattlesnake, except the tail, which with its rattles projected from the mouth. The statement lacked the mention of names, thus affording no clue for a proper inquiry into the facts of the case.

The old residents of the Pines say that the Pine Snake will follow a person, but that if you approach the reptile, it will at once turn to escape. This habit, indicating inquisitiveness and timidity, Mrs. Mary Treat informs me that she has herself witnessed, in the woods at May's Landing, N. J.

I have received statements from long residents which make it highly probable that the Pine Snake lays its eggs in the sandy soil, where it is dry, and of course somewhat higher than the swamps and streams. Also, I believe that the skunk (*Mephitis chinga*) has much to do with keeping down the increase of *Pituophis*, it being, in the Pines of New Jersey, somewhat expert in finding, and voracious in devouring the eggs of this snake.

Desirous to know whether the Pine Snake does carry the vindictiveness towards the rattlesnake imputed to it, and any other facts that might help to a knowledge of the life-history of the species, I would be glad to see notes on this subject contributed to the NATURALIST, either directly, or through the present writer.—SAMUEL LOCKWOOD, *Freehold, N. J.*

A LITERARY GEM.—In that comedy of errors which one C. G. Giebel caused to be printed under the title of *Thesaurus Ornithologie*—that treasury of blunders—it is hard to select the champion error. But the gem of this precious collection is perhaps at p. 96, where we read:—"LINING, J., extract of a letter with his answers to several queries sent to him concerning his experiments of electricity with a kite (Falco).—*Philos. Transact.* 1755, xlviii, 757."

Shade of Ben. Franklin!—with a kite!!—Falco!!! Why did not the accurate and scholarly Giebel say *Falco longicaudatus*—for the kind of "kites" referred to, as every little boy knows, have several yards of tail! This ornithological item is given under head of "Anatomy and Physiology." We sighed, and mechanically turned the leaves back to look under "B" for *Burton's Anatomy of Melancholy*, but the inconsistent Giebel had overlooked this; perhaps he thought his book sad enough already. We beg

to respectfully suggest the following ornithological titles for his next edition :—

THACKERAY, W. M. Adventures of Timothy Titmarsh (*Parus palustris*).

HUSBAND, A. Letter to his Little Duck (*Anas*) of a Wife (*sponsa*), enquiring whether the Baby is still a Creeper (*Certhia*). [N. B. If Dr. Giebel should be in doubt under which one of his xxxiii headings this title should come, he might put it under "Propagatio" or under "Monographs of Families."]

POLICEMAN, A. On the Jayl-birds (*Garrulus*) and Gutter-snipes (*Scolopax gutturalis*) of the metropolis; or, how to go on a Lark (*Alauda*).

GIEBEL, C. G. Ornithological evidences of Lunacy (Loon-icy, *Colymbus glacialis*).

THE EUROPEAN CABBAGE BUTTERFLY probably made its appearance in the neighborhood of Cleveland, Ohio, during the season of 1873, but its ravages did not attract special attention till the summer of 1874, when many thousands of dollars were lost by the wholesale destruction of cabbages and cauliflowers in this section. We have also received notice of similar devastation among these plants in Western Pennsylvania (1874), probably caused by the larvæ of this same insect pest. Fortunately for the vegetable gardeners, however, the active European parasite of the *Pieris* is also on hand, and scarcely less than ninety per cent. of last year's cocoons are now found more or less completely filled with individuals of the bronzen ichneumon-fly known as *Pteromalus puparum*, either in the larval or pupa state. — T. B. COMSTOCK.

THE LARK BUNTING. — While with the Yellowstone Expedition of 1873, under Gen. Stanley, I collected some material, amongst which was a nest of the Lark bunting, *Calamospiza bicolor* Bonap.), containing three eggs of the same, with one parasitic egg, which I have every reason to believe was that of the Crow Black bird (*Molothrus pecoris* Swainson), as I am well acquainted with the eggs of this bird, and also, because it was found at the same localities, where the Lark bunting seemed to settle. The nests of the latter were generally found at the head-waters of the various streams running either into the Heart or Big Knife Rivers, in fact so close to the springs that in many places the ground was moist. The nests which I found were generally under or amongst tufts of grass, or other shrubs of a stunted

character. Mr. Allen, who accompanied us, has probably described the nests and eggs, ere this, so I will not go into details. — W. HOFFMAN, M.D.

GEOLOGY AND PALEONTOLOGY.

ON THE ORDER AMBLYPODA. — Prof. Cope recently read a paper on the structure of the feet of *Bathmodon*, showing that they resembled in many points those of the Elephants but differed in others. He finds five toes on each foot, which are very short and furnished with small transverse hoofs. The bones of the carpus resemble closely those of *Toxodontia*. In the hind foot the arrangement is like that of the Elephants except that the navicular bone is withdrawn to the outer side so as to bring the cuboid and one cuneiform bone into contact with the astragalus. On the characters thus ascertained he based the definition of a new order of mammals. The *Amblypoda* which presents two sub-orders, the *Pantodonta* represented by *Bathmodon*, and the *Dinocerata* represented by *Uintatherium*.

ANTHROPOLOGY.

PERFORATION OF THE HUMERUS CONJOINED WITH PLATYCNEMISM. — Associated with that extreme development of platycnemism discovered by the writer, some years ago, in the ancient mounds on the Detroit and Rouge Rivers, Michigan, he has found the perforation of the humerus. Allusion is made to that peculiarity of the arm bone in which is presented a communication of the two fossæ at its lower end. It is difficult to arrive at the exact amount of the percentage to which this prevails in these mounds; though there can be little doubt that at least 50 per cent. of the humeri have this characteristic. This is of interest as being in excess of that from the mounds in other parts of the country, where it is calculated as being only 31 per cent. It is a characteristic which, significantly enough, exists in the ape, pertains to the negro in a large degree, while it is very rarely encountered in any of the white races.

In a letter received last year from Prof. Busk, F. R. S., he attaches importance to the writer's discovery of this conformation of the humerus being a peculiarity of platycnemic man, and states